

Listing of Claims

1-23. (Cancelled)

24. (Previously Presented) An apparatus for automatically determining a type of an external device, comprising:

a jack for coupling the external device;

an impedance detecting circuit, coupled to the external device through the jack, for generating a first analog signal according to an impedance of the external device and a first resistance, a second analog signal according to the impedance of the external device and a second resistance and a third analog signal according to the impedance of the external device and a third resistance, wherein the first, second and third resistances are different;

an analog-to-digital converter, coupled to the impedance detecting circuit, for converting the first, second and third analog signals to first, second and third digital values, respectively; and

a control circuit, coupled to the analog-to-digital converter, for determining the type of the external device when the first digital value falls within a first predetermined range, the second digital value falls within a second predetermined range, the third digital value falls within a third predetermined range and all of the first, second and third predetermined ranges together indicate a same recognized condition among a plurality of predetermined recognized conditions;

wherein the impedance detecting circuit comprises a plurality of resistors, which couples together in parallel, for providing the first, second and third resistance and each of the first, second and third digital values is a multi-bit number.

25. (Previously Presented) The apparatus of claim 24, wherein the impedance detecting circuit comprises:

a switching circuit for selectively coupling at least one of the resistors to the external device and thereby sequentially generating a the first, second and third analog signals which are respectively converted into the first, second and third values by the analog-to-digital converter.

26. (Previously Presented) The apparatus of claim 24, wherein at least two of the first, second and third predetermined ranges are different.

27-28. (Cancelled)

29. (Previously Presented) The apparatus of claim 24 further comprising:

a connection detecting circuit, coupled between the jack and the impedance detecting circuit, for determining whether the external device couples to the jack such that the impedance detecting circuit generates the first, second and third analog signals when the connection detecting circuit determines the external device being coupled to the jack.

30. (Previously Presented) The apparatus of claim 24, wherein the control circuit disconnects the coupling relation between the impedance detecting circuit and the jack after determining the type of the external device.

31. (Previously Presented) The apparatus of claim 30 further comprising:
a multiplexing circuit for coupling the external device to an internal circuit according to the type of the external device determined by the control circuit.

32. (Previously Presented) The apparatus of claim 24 further comprising:
a decoder, coupled to the control circuit, for receiving a first number of outputs from the control circuit and thereby generating a second number of outputs;
wherein the second number is larger than the first number.

33. (Previously Presented) A method for automatically determining a type of an external device, comprising:

providing a plurality of predetermined resistances by a plurality of resistors coupled together in parallel;

generating a first analog signal according to a first coupling relation between a the plurality of predetermined resistances and an impedance of the external device;

generating a second analog signal according to a second coupling relation, which is different from the first coupling relation, between the plurality of predetermined resistances and the impedance of the external device;

generating a third analog signal according to a third coupling relation, which is different from the first and second coupling relations, between the plurality of predetermined resistances and the impedance of the external device;

respectively converting the first, second and third analog signals to first, second and third digital values; and

determining the type of the external device when the first digital value falls within a first predetermined range, the second digital value falls within a second predetermined range, the third digital value falls within a third predetermined range and all of the first, second and third ranges together indicate a same recognized condition among a plurality of predetermined recognized conditions;

wherein each of the first, second and third digital values is a multi-bit number.

34. (Previously Presented) The method of claim 33 further comprising:

decoupling a first resistor of the plurality of resistors from the impedance of the external device before coupling a second resistor of the plurality of resistors to the impedance of the external device;

decoupling the second resistor from the impedance of the external device before coupling a third resistor of the plurality of resistors to the impedance of the external device; and

decoupling all of the plurality of resistors from the impedance of the external device after constituting the recognized condition.

35. (Previously Presented) The method of claim 33, wherein at least two of the first, second and third predetermined ranges are different.

36-37. (Cancelled)

38. (Previously Presented) An apparatus for determining a type of an external device, comprising:

a jack for coupling the external device;

an impedance detecting circuit, coupled to the external device through the jack, for generating a first analog signal according to an impedance of the external device and a first resistance, a second analog signal according to the impedance of the external device and a second resistance and a third analog signal according to the impedance of the external device and a third resistance, the impedance detecting circuit comprising:

a plurality of detecting paths coupled together in parallel, each of the detecting paths comprising a resistor and a transistor coupled together in series, and on/off conditions of the transistors determining the first, second and third resistances;

an analog-to-digital converter, coupled to the impedance detecting circuit, for converting the first, second and third analog signals to first, second and third digital values; and

a control circuit, coupled to the analog-to-digital converter, for determining the type of the external device when the first digital value falls within a first predetermined range, the second digital value falls within a second predetermined range, the third

digital value falls within a third predetermined range and all of the first, second and third predetermined ranges together indicate a recognized condition among a plurality of predetermined recognized conditions;

wherein the first, second and third resistances are different and each of the first, second and third digital values is a multi-bit number.

39. (Previously Presented) The apparatus of claim 38, wherein the plurality of detecting paths comprises:

a first detecting path comprising a first resistor and a first transistor coupled in series;

a second detecting path, coupled to the first detecting path in parallel, comprising a second resistor and a second transistor coupled in series; and

a third detecting path, coupled to the first and second paths in parallel, comprising a third resistor and a third transistor coupled in series;

wherein the first resistance is determined when the first transistor is switched on and the second and third transistors are switched off, the second resistance is determined when the second transistor is switched on and the first and third transistors are switched off and the third resistance is determined when the third transistor is switched on and the first and second transistors are switched off.

40. (Previously Presented) The apparatus of claim 38 further comprising:

a connection detecting circuit, coupled between the jack and the impedance detecting circuit, for determining whether the external device couples to the jack such

that the impedance detecting circuit generates the first, second and third analog signals when the connection detecting circuit determines the external device being coupled to the jack.

41. (Previously Presented) The apparatus of claim 38, wherein the control circuit disconnects the coupling relation between the impedance detecting circuit and the jack after determining the type of the external device.

42. (Previously Presented) The apparatus of claim 41 further comprising:
a multiplexing circuit for coupling the external device to an internal circuit according to the type of the external device determined by the control circuit.

43. (Previously Presented) The apparatus of claim 38 further comprising:
a decoder, coupled to the control circuit, for receiving a first number of outputs from the control circuit and thereby generating a second number of outputs;
wherein the second number is larger than the first number.